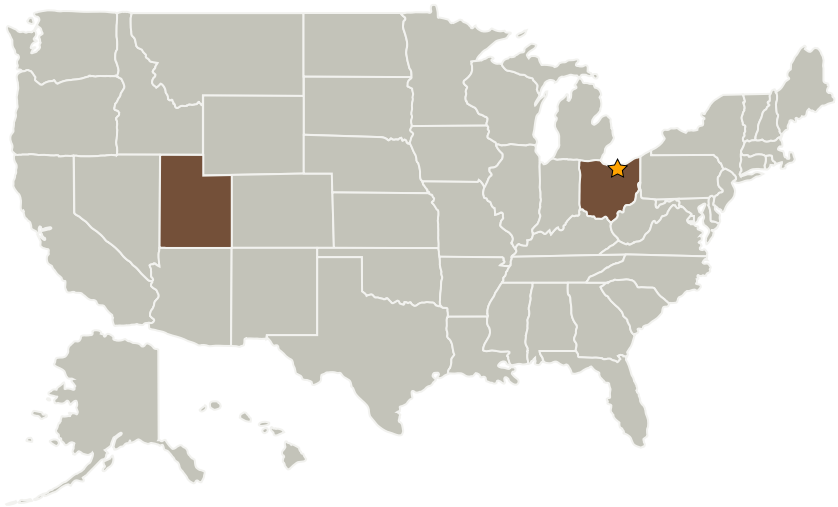
Emissive Ion Thruster -EMIT, Phase I

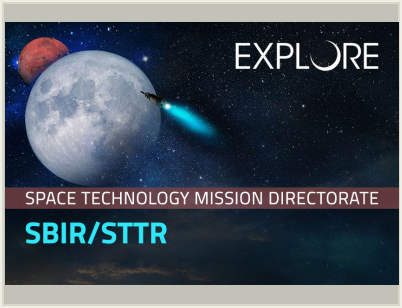
Completed Technology Project (2004 - 2004)

Project Introduction

A propulsion system is proposed that is based on acceleration of ions emitted from a thin, solid-state electrochemical ceramic membrane. This technology would provide a versatile propulsion system that would be suitable for long-term, low-thrust missions throughout the deep-space to near-Earth range. The specially formulated and fabricated membrane in combination with an applied bias voltage will be used to ionize propellant electrolytically and selectively pass ions from the membrane through an ion acceleration stage thereby producing an energetic ion beam and generating thrust. Previously, electrostatic ion propulsion systems have used ion production mechanisms based on electron bombardment ionization, contact ionization, or direct ion extraction from field emission structures. In contrast, ceramic membranes operate at modest temperatures and are theoretically capable of forming ions at ion energy costs that approach dissociation energies (e.g., ~1-2 eV/ion). In addition to being readily scalable to larger sizes, the ion flux through the ceramic membranes is easily controlled over large ranges and this enables deep throttling capabilities. Ceramic membranes are rugged and insensitive to contamination from atmospheric gases, and they have displayed very long lifetimes in similar applications. Furthermore, ceramic membranes do not require the high voltages associated with field emission schemes.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Ceramatec, Inc.	Supporting Organization	Industry	Salt Lake City, Utah

Primary U.S. Work Locations	
Ohio	Utah

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Merrill Wilson

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.2 Electrostatic